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Market Response to the Weekly Money Supply Announcements in the 1970s

THOMAS URICH and PAUL WACHTEL*

ABSTRACT

The hypothesis that the weekly announcement of the money supply affects interest rates is examined. The announcement effect is interpreted as a policy anticipation effect. That is, an unanticipated increase in the money supply leads to an increase in interest rates in anticipation of future tightening by the Federal Reserve. Estimates of this effect with proxies for the unanticipated change constructed from a survey of money supply forecasts and an ARIMA model indicate that: (a) financial markets respond very quickly to the announcement; and (b) the response was largest when policymakers emphasized the importance of the monetary aggregates.

FINANCIAL MARKET PARTICIPANTS ARE careful observers of the weekly money supply announcement, and generally agree that the announcement often leads to changes in interest rates. This occurs because the announcement leads market participants to revise their expectations both of future Federal Reserve policy actions and of future economic conditions. In this paper we examine the response of yields on Treasury bills to the announcement of the money supply and the extent to which that response has varied in the last ten years.

Money supply announcements may affect market interest rates in three ways. First, actual expansion of the money supply leads to lower interest rates through a liquidity effect. However, rapid monetary growth which is not anticipated leads market participants to expect the Federal Reserve to counteract such growth in the future. As a consequence, there may be a policy anticipation effect which causes higher interest rates in anticipation of future tightening. Furthermore, prolonged rapid monetary growth also creates inflation and inflationary expectations which lead to higher interest rates. Thus, there may exist a third effect, the inflationary expectations effect which also leads to higher interest rates. Our interest in this paper is in the immediate market response to the weekly announcement of the money supply, which, as we argue below, is most likely to be a policy anticipation effect.

The policy anticipation effect is best described by example. Suppose that the announced change in the money supply exceeds that which was expected by

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market participants on the basis of past experience and policy announcements. Suppose also that monetary growth is the Federal Reserve's policy concern. It would, therefore, be reasonable to expect that the Federal Reserve will attempt to reduce the growth of the money supply. Policy actions to do so would increase the Federal Funds rate and consequently other market interest rates would also go up in anticipation. For this reason, the policy anticipation effect of an unanticipated increase in the money supply is an increase in market yields.

A liquidity effect which reduces yields when the money supply increases is not a likely response to the money supply announcement because the liquidity effect takes place when open market operations are conducted. The announcement made at the end of the week provides data for the money supply on Wednesday of the previous week. In addition, the money supply is affected by the open market operations which took place some time earlier.

Although increases in the money supply can lead market participants to revise upward their expectations of inflation and perhaps of real growth, such responses are both gradual and delayed.¹ Thus, the immediate effect of the money supply announcement is likely to be a consequence of the expectation of a response by the Federal Reserve. A change in Federal Reserve policy can take place on the day after the announcement when open market operations commence. We will examine the announcement effect on interest rates, both before and after the Federal Reserve is able to intervene in the markets.

Prior to 1980, the money supply data were typically released late on Thursday afternoon, by which time the Federal Reserve had ceased its open market activities for the day. Market intervention by the central bank was not resumed until midmorning on Friday. Therefore, changes in interest rates from the end of trading activity on Thursday (prior to the announcement) to the start of trading on Friday reflected only the market response to the announcement. The effects of possible delayed market responses and of Federal Reserve intervention are analyzed by examining changes in interest rates between the open and close of trading on Friday.²

Although the financial press frequently attributes interest rate movements on the days after the money supply announcement to a policy anticipation effect, the existence of the effect may be questioned. Since the money supply announced to the public was already known to the Federal Reserve, policymakers could already have made their response. In this case there are no future policy implications of a money supply announcement and no reason for a policy anticipation effect on interest rates. In fact, this is not likely because policymakers have, at best, a few days advanced information and often take some time to evaluate and interpret the new information. Furthermore, the directives of the Open Market Committee (prior to 6 October 1979) emphasized orderly change in

¹ Milton Friedman [6] argues that the inflationary expectations effect now takes place within a month or two, whereas it used to take about six months for this response to develop.

² The overnight period is sufficiently short, so that it is reasonable to assume that no other information affects yields in a systematic way. During the day on Friday, the Fed may intervene to offset any market response to the announcement. This could happen if the Fed is concerned about interest rate stability.

the Federal Funds rate, hence a policy response to unsatisfactory monetary growth was apt to be gradual. Another reason for gradual policy responses is that the Federal Reserve itself is often uncertain about the accuracy of its own money supply data and forecasts.

During the 1970s, there was a great deal of variation in the market responses to the money supply announcements. We find that the response to unanticipated changes in the money supply first increased and then decreased, and we interpret this as a change in perceptions of the Federal Reserve's commitment to a monetarist approach. If the Fed were following a monetarist approach, its emphasis would have been on the monetary aggregates rather than on the stability of interest rates. In that case, market participants would expect a policy response to unanticipated changes in the money supply, and would therefore react to such an announcement. Our results indicate that the mid 1970s can be viewed as such a period.

The most problematic aspect of any study of unanticipated change in economic activity is the procedure used to develop a proxy for expectations, in this case about the change in the money supply. It is now standard to use ARIMA model proxies for expectations. In this study, an additional measure of expectations is available from a survey of weekly money supply forecasts that has been conducted since 1977. Thus, for the last part of the period under study, the unexpected change in the money supply from the survey data can be compared with the ARIMA residuals. Both measures of the unanticipated change yield similar results, providing substantial support for the use of time series models in this context.

In the next section of this paper, we explain our basic sources of data and the proxies for the expected change in the money supply. This is followed by a discussion of the main results. The results of tests for differential responses to positive and negative unanticipated change are then reported, and the response to unanticipated changes when the money supply is outside the open market committee's two-month growth ranges is shown. The final section contains our conclusions.

I. The Data

Interest rates

Average market discount rates of return for the most recently issued 3 month Treasury Bill at the Thursday close, Friday open, and Friday close were taken from the daily quote sheets prepared by the Federal Reserve Bank of New York.³

³ While the secondary market for Treasury bills is an over-the-counter market with no fixed open or close, these quotes represent the Federal Reserve Bank of New York's first and last survey of reporting securities dealers for the day. These surveys take place at about 10:30 A.M. and 3:30 P.M. respectively. Note that the last survey of the day on Thursday precedes the money supply announcement.

The discount rates were converted to continuously compounded annual rates of return.⁴

Money Supply

The weekly data on the money supply were obtained from the H.6 releases of the Federal Reserve. The data used are the seasonally adjusted series for the narrowly defined money supply, M_1 . For the period under consideration, 1970–79, the money supply was rebenchmarked several times. In order to have consistent data for time series analysis, it was necessary to change the levels of the published data. However, the week-to-week changes are maintained as they were announced.⁵

Expected Money Supply

There are two sources of data on the expected money supply: predicted values from ARIMA models and the median forecasted change from the survey.

Since September 1977, Money Market Services of San Francisco has collected dealer firm forecasts of the weekly change in M_1 , by telephone, first on Tuesday morning and again on Thursday morning. The median forecasts are usually based on 55 to 60 responses.⁶

Two difficulties arise in using ARIMA estimates as proxies for expectations. First, the ARIMA structure may be nonstationary. Secondly, the ARIMA models which proxy expectations are estimated with sample period data which were not available when the expectations were formed. The first problem is dealt with by specifying ARIMA models for each calendar year.⁷ There is no ready solution to the second problem except to compare the results obtained using the ARIMA residuals with the results obtained using the survey data when they are available.⁸

⁴ The yield is defined by:

$$\frac{365}{n} \ln \left(1 / \left(1 - \frac{n}{360} R \right) \right)$$

where R is the discount rate and n is the number of days to maturity (usually 91 on Thursdays, but sometimes 90 or 92, if there is a holiday during the maturity week).

⁵ The announced change in the money supply can be defined alternatively as $({}_tM_{t-1} - {}_{t-1}M_{t-2})$ or $({}_tM_{t-1} - {}_tM_{t-2})$ where ${}_tM_j$ is the announcement made in week i of the money supply for statement week j . The first measure is then the difference between the current and last announced money supply data. It differs very slightly from the second measure which reflects revisions made this week to the previously announced data. Time series models and further results with both series are indistinguishable. All results in this paper make use of the first definition shown above.

⁶ The authors are grateful to Money Market Services for providing the data. At this time only the median responses are available. In this study, only results with the Thursday morning survey are presented because the estimates of the announcement effect are virtually the same with both surveys.

⁷ Although the choice of calendar years is arbitrary, results were not altered when different time periods are used.

⁸ There is a procedure to overcome this problem which is too cumbersome for practical application. This is: estimate an ARIMA model with data prior to the initial survey week and construct a one week-post sample forecast. For the next week, the ARIMA model is re-estimated with an additional data point, and another post sample forecast is generated. However, the coefficients do not change sufficiently from week to week to warrant the repeated re-estimation of the ARIMA structure.

We find that survey responses which are true *ex ante* measure of expectations are broadly similar to the ARIMA predictions.

Specification tests for the ARIMA model indicate that the money supply can best be explained by a second order autoregressive structure of the first difference in the money supply.⁹ This model was estimated for each year and the parameter estimates, which change from year to year, are available from the authors. The estimates of the effect of the ARIMA residuals (the proxy for unanticipated change in the money supply) on interest rates are robust to changes in the specification of the ARIMA model.

II. The Announcement Effect

If market participants are knowledgeable users of available information, then only the unanticipated component of the change in the money supply should affect interest rates.¹⁰ This rational expectations or market efficiency hypothesis is tested by estimating:

$$D = \beta_0 + \beta_1(\Delta M - \Delta \hat{M}) + \beta_2 \Delta \hat{M} \quad (1)$$

The dependent variables are, first, the change in interest rates from Thursday at about 3:30 P.M. immediately prior to the announcement of the change in the money supply, ΔM , to Friday morning at about 10:30 A.M. when trading commences; and, secondly, the change in interest rates from Friday morning to the close of business Friday afternoon. The first independent variable is the unanticipated component of the announced change in the money supply and the second is the expected change itself.

Table I presents the annual estimates of Equation (1) for the period 1970 to 1979. The residuals and predicted values from ARIMA models for ΔM are the respective proxies for the unanticipated and anticipated components in (1). Thus, the independent variables are orthogonal, which means that the estimates of β_1 , the effect of unanticipated change in the money supply in interest rates, are the same as would be obtained by regressing the change in interest rates on the unanticipated change in the money supply (i.e. assuming that $\beta_2 = 0$ in (1)).¹¹ Positive and significant estimates of the coefficient β_2 would indicate market inefficiency in that market participants have failed to incorporate the anticipated change in the money supply into interest rates.

The results in Table I support the efficiency hypothesis; they indicate that the unanticipated change in the money supply has an immediate (overnight) impact on interest rates, although the magnitude of the impact varies considerably over

⁹ See also the specification tests for a longer period by Urich [10] which indicate a similar structure.

¹⁰ A similar argument is found in the macroeconomic literature to show that only unanticipated movements in the money supply affect real economic variables (see Barro [1]). Also, Urich [9] uses a rational expectations framework to model short run market responses to the money supply announcement.

¹¹ There is a slight, but inconsequential, deviation from orthogonality because the ARIMA models were estimated with all the weekly data while the estimates in Table I eliminate a few observations each year because either the money supply was not announced on a Thursday afternoon or the Treasury Bill quotes were not available.

Table I
Estimates of Announcement Effect on Interest Rates

	β_0	β_1	β_2	R^2	SER	DW	MAV
Part A—Dependent variable: Change in Interest Rate from Thursday Close to Friday Open							
1970	-.0049 (1.7)	-.0013 (0.8)	-.0077 (1.4)	.06	.0187	1.54	.012
1971	-.0068 (0.9)	.0043 (1.1)	.0207 (0.9)	.05	.0296	2.37	.019
1972	.0017 (0.4)	.0007 (0.2)	-.0038 (0.6)	.01	.0241	2.08	.016
1973	-.0108 (1.1)	.0118 (1.4)	.0087 (0.7)	.05	.0667	1.73	.041
1974	-.0174 (1.5)	.0301 (3.6)	.0072 (0.5)	.23	.0771	1.40	.063
1975	-.0135 (1.4)	.0270 (4.7)	-.0209 (1.0)	.33	.0560	1.88	.045
1976	-.0001 (0.01)	.0162 (5.4)	-.0079 (1.4)	.42	.0300	1.50	.029
1977	.0099 (1.7)	.0117 (3.8)	-.0074 (1.1)	.25	.0346	2.15	.027
1978	.0069 (0.8)	.0045 (1.1)	-.0132 (1.6)	.08	.0530	1.78	.041
1979*	.0208 (2.3)	.0090 (2.2)	-.0060 (0.5)	.13	.0461	1.98	.034
Part B—Dependent variable: Change in Interest Rate from Friday Open to Close							
1970	-.0139 (2.2)	.0073 (1.3)	-.0443 (2.5)	.16	.0592	1.87	.040
1971	.0010 (0.1)	.0014 (0.2)	-.0416 (0.9)	.02	.0643	1.82	.045
1972	-.0019 (0.2)	.0008 (0.1)	-.0085 (0.7)	.01	.0517	1.71	.033
1973	.0001 (0.0)	.0193 (1.7)	.0160 (0.9)	.08	.0926	1.79	.062
1974	-.0279 (1.0)	-.0054 (0.3)	-.0360 (1.0)	.03	.1814	1.61	.119
1975	.0103 (0.9)	.0175 (2.2)	-.0249 (0.9)	.11	.0779	2.14	.068
1976	-.0044 (0.7)	.0037 (0.9)	-.0036 (0.5)	.03	.0431	2.40	.028
1977	.0065 (0.7)	.0008 (0.1)	-.0149 (1.4)	.04	.0576	2.11	.033
1978	.0212 (1.8)	-.0022 (0.4)	.0025 (0.2)	.01	.0731	2.12	.050
1979*	.0245 (1.4)	.0210 (2.7)	.0030 (0.1)	.17	.0906	1.78	.065

$$D = \beta_0 + \beta_1 (\Delta M - \Delta \hat{M}) + \beta_2 \Delta \hat{M}$$

Notes: Absolute values of t -statistics are shown in parentheses. SER is the standard error of the regression. DW is the Durbin-Watson statistic. MAV is the mean absolute value of the dependent variable.

* Through September.

the past decade. There is no indication of any independent influence of the anticipated change itself and little evidence of any announcement effect on interest rate movements on Friday.¹² These results support our interpretation of the announcement effect as a policy anticipation effect. That is, the immediate positive effect of unanticipated changes in the money supply on interest rates reflects the market participants' expectations of a Federal Reserve policy response. The absence of any separate effect of the anticipated change in the money supply suggests that the announcement does not have a liquidity effect which could be anticipated from past policy actions.

A clear pattern emerges from the sequence of estimates of β_1 in the regressions in Table I for the overnight change in interest rates. In the early 1970s, unanticipated changes in the money supply had no apparent effect on the Thursday to Friday changes in interest rates. Significant positive effects are observed after 1974 and the largest effects are in 1974 and 1975. In those years, a \$1 billion unanticipated increase in the money supply led to an increase of rates of about 3 basis points.¹³ In the late 1970s, the coefficients are also significantly greater than zero (with the exception of 1978). However, since 1976, their average value is less than half that of the earlier period.

These trends in the coefficients are consistent with a simple interpretation of changes in the perceived conduct of monetary policy. It was only in the early 1970s that policymakers and market participants began to pay attention to the monetary aggregates.¹⁴ Our results indicate that by 1974 the Federal Reserve was following an aggregates policy and that market participants expected that unanticipated monetary growth would lead to Fed intervention.

Financial market developments in the mid and late 1970s provide reason for the small market responses to unanticipated change in the money supply indicated in our results starting in 1976. First, econometric studies make note of an apparent downward shift in the money demand function starting in late 1974 (see Enzler, Johnson, and Paulus [5]). Second, the minutes of the Open Market Committee which are now available placed greater emphasis on market conditions or interest rates than on the monetary aggregates in the late 1970s (see Lang [8]). Finally, institutional changes in the banking system (e.g. the introduction of automatic transfers between demand and time deposits in 1978) reduced the emphasis on any specific definition of the monetary aggregates. These develop-

¹² Re-estimation of these equations with a correction for first order serial correlation made no substantial change in the results.

¹³ These results are broadly similar to those by Berkman [2], who analyzed the change in interest rates from Thursday close to Friday close. He found a 2½ basis point change in the Treasury bill rate from a \$1 billion unanticipated change in the money supply. The only other study of these issues, by Cornell [3], concludes that there is no announcement effect because the variance in the change in interest rates from Thursday to Friday is not significantly larger than it is on other days. The existence of many sources of interest rate volatility does not, however, obviate the direct evidence presented here.

¹⁴ The Open Market Committee directives began to place some emphasis on controlling the aggregates in early 1970. In a study of Federal Reserve policy making, deRosa and Stern [4] find that there is evidence of an attempt to control the monetary aggregates in the 1970-74 period while there is none in the 1967-69 period. However, they conclude that the effect of undesired monetary growth on the Federal Funds rate, the operating instrument for monetary policy, was both small and uneven.

ments suggest that a given unanticipated money supply change would be difficult to interpret and that a smaller Federal Reserve policy response could be expected.

The decline in β_1 estimates indicates that market participants were aware of these changes and that the change in the Federal Reserve's stated policy stance actually did take place. Additional evidence of a change in policy towards an interest rate orientation is provided in an analysis of the influence of deficits on monetary growth by Hamburger and Zwick [7].

III. Results with Survey Data

Since participants in the Treasury Bill market are by and large professionals with easy and rapid access to information on the monetary system, we expect their own forecasts to be rational, more accurate than forecasts generated from ARIMA models, and more relevant to the movements in interest rates. For this reason, the survey of money supply forecasts is used to estimate the effect of the money supply announcement on interest rates.

Estimates of the announcement effect are shown in Table II with proxies for the unanticipated change in the money supply constructed from the median survey response and from an ARIMA model. The equations are estimated for a two year period beginning September 1977.

Results with the survey and ARIMA proxies are in close agreement; both indicate that the money supply announcement impacts on the money markets very quickly. However, the overnight effect of an unanticipated change in the money supply is about twice as large with the survey proxy than with the ARIMA measure. The effect is still small; a \$1 billion unanticipated increase in the money supply leads to an increase in interest rates of a little more than one basis point. In addition, the survey measure explains about twice as much of the variation in the overnight change in interest rates than does the ARIMA proxy. Neither the survey or ARIMA measures of unanticipated change in the money supply

Table II
Announcement Effect for the Survey Period

Measure of $\Delta \hat{M}$	β_0	β_1	β_2	R^2	SER	DW
Dependent variable: Change in Interest Rates from Thursday Close to Friday Open						
ARIMA	.0105 (2.0)	.0062 (2.3)	-.0105 (1.9)	.09	.0474	1.83
Survey	.0181 (3.4)	.0119 (4.2)	-.0100 (2.8)	.20	.0445	1.77
Dependent variable: Change in Interest Rates from Friday Open to Close						
ARIMA	.0179 (2.0)	.0063 (1.4)	.0027 (0.3)	.02	.0796	1.88
Survey	.0147 (1.5)	.0037 (0.7)	.0082 (1.2)	.02	.0796	1.88

$$D = \beta_0 + \beta_1(\Delta M - \Delta \hat{M}) + \beta_2 \Delta \hat{M}$$

Note: Absolute values of t -statistics are shown in parentheses.

indicates any announcement effect that persists into Friday. The only anomalous result is the significant effect of anticipated change in the regression for the overnight change with the survey data. This result indicates that market participants have failed to incorporate some available information into interest rates or into their money supply forecasts, and it is probably due to bias introduced by using the median survey response.

IV. Differences in the Announcement Effect

In this section we summarize results which allow the form of the relationship between the unanticipated change in the money supply and interest rates to be more complex. For example, given the Federal Reserve's concern about inflation, the expected policy response to positive unanticipated changes in the money supply may be larger than for negative ones. This hypothesis was tested by estimating the overnight effect of the announcement with positive and negative ARIMA residuals separated into two variables. For four years in the mid-1970s, this differentiation reduces the standard error of the equation.¹⁵ The results are striking for 1974 and 1975. In 1974, positive unanticipated change has a coefficient of .16 and negative unanticipated change has a zero coefficient. In the recession year of 1974, the results are reversed. Negative unanticipated change has a coefficient of .05 and positive change has a zero coefficient.

Since the mid 1970s, the Open market Committee has formulated monetary policy in terms of target ranges for the growth rates of M_1 and M_2 , and the Fed Funds rate, as well as other variables. Reports in the financial press suggest that the market's response to the money supply announcements depend on whether or not the money supply is inside the target range. The rationale for this is that market participants feel more certain that the Fed will respond to unanticipated changes when the money supply is outside the target range. This would be especially true if the Federal Reserve adopts an anti-inflationary policy when the money supply moves above the upper limit. On the other hand, market participants may be uncertain of the Fed's response to the announced changes when the money supply is inside the target range since the money supply may still be consistent with Fed policy. The hypothesis that only unanticipated changes outside the target bands affect interest rates can be tested with another simple change in the basic regression specification.

The proxy for the unanticipated change in the money supply (the ARIMA residuals) is separated into three groups: (1) unanticipated change when it is positive and the money supply is above the upper limit of the target band; (2) unanticipated change when it is negative and the money supply is below the lower band; and (3) all other unanticipated changes.¹⁶ This procedure was used

¹⁵ The equation estimated was:

$$D = \gamma_0 + \gamma_1(\Delta M - \Delta M)^+ \gamma_2(\Delta M - \Delta M)^-$$

where the first independent variable is defined as the ARIMA residual when it is positive and zero otherwise. This distinction is significant in 1971, 1972, 1974, and 1975.

¹⁶ The FOMC determines short run (two month) target bands for the monetary aggregates at each monthly meeting for the current and following month. The bands used here are the short run targets in effect at the time of the money supply announcement. Although they are not yet announced to the

to estimate the announcement effect on the overnight change in interest rates starting with 1976 which was the first year that the short run target ranges were released with a one month lag. For 1976 and 1977, the results show that the positive unanticipated changes above the band and negative unanticipated changes below the band have significant explanatory power while the other changes were not significant. These results indicate that the market reacted to unanticipated changes in the money supply only when the money supply was outside the target bands. In 1978 and 1979, none of the variables were significant. This is probably due to the shift in emphasis to controlling money market conditions rather than monetary aggregates discussed earlier.

V. Conclusion

Our analysis provides substantial evidence for the effect of unanticipated changes in the money supply on interest rates, a phenomenon that has been widely noted by market participants and the press. The major points can be summarized as: (1) the financial markets respond very quickly to the weekly money supply announcement. Furthermore, only the unanticipated component of the announcement seems to have a consistent effect on interest rates which indicates that the market embeds all relevant information into rates; (2) the magnitude of the announcement effect has varied widely over the course of the 1970s. Importantly, this variation is consistent with changes in the operating procedures of the Federal Reserve System. Larger announcement effects are found, as expected, when policy has emphasized the monetary aggregates and when the money supply deviates from the target bands; and (3) the evidence on the announcement effect supports the hypothesis that market participants respond in anticipation of a Federal Reserve policy response.

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public, the bands change slowly from month to month and market participants have well formed expectations about the bands.